

Health System Evaluation: the case of in-hospital fatality for acute myocardial infarction in Italian regions

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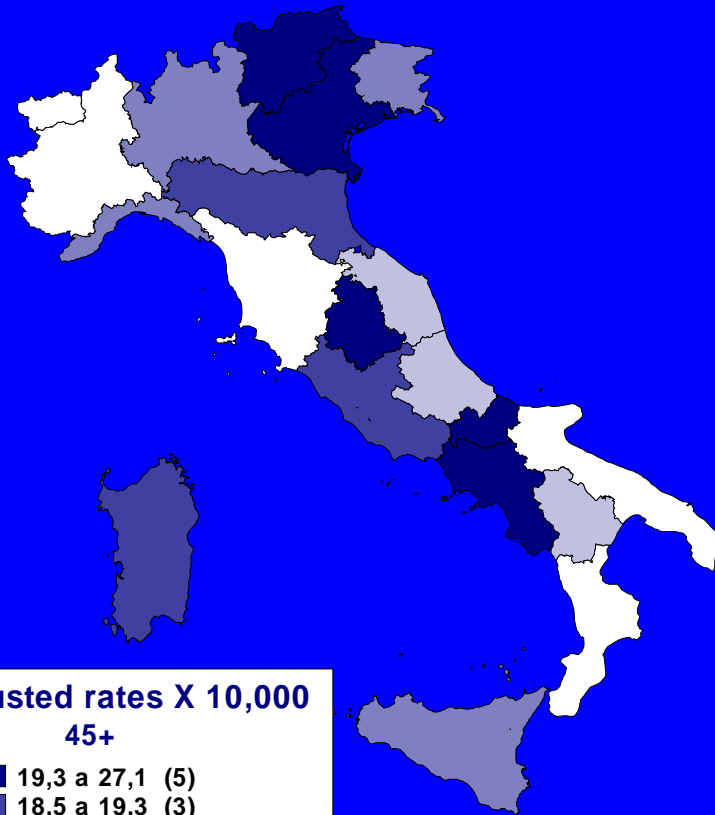
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Rationale

- **Acute myocardial infarction needs to be promptly and appropriately treated**
- **Investigation of emergency hospital care efficiency and quality at regional level**

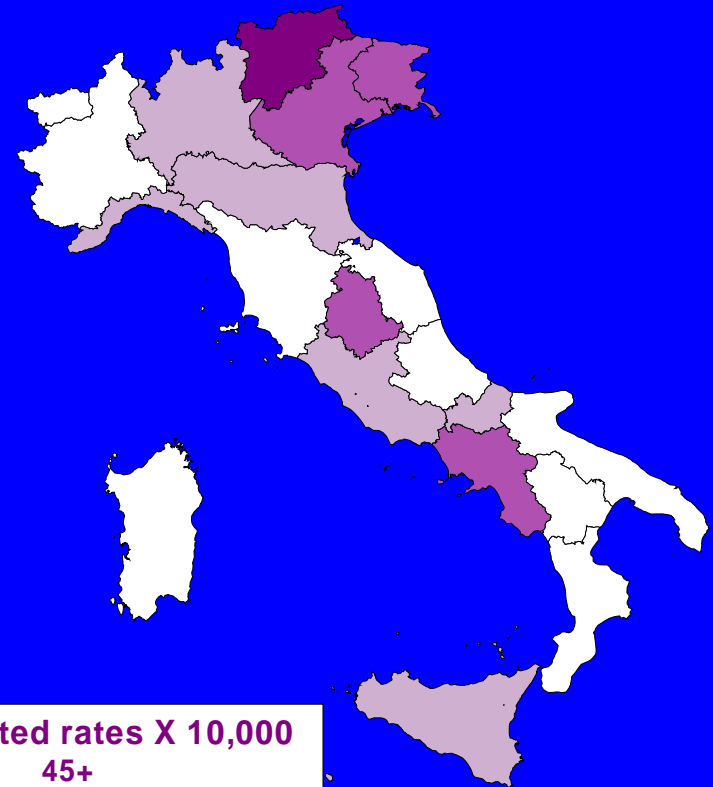
Infarction mortality rates in 1999-2000



Age-adjusted rates X 10,000
45+

- 19,3 a 27,1 (5)
- 18,5 a 19,3 (3)
- 17,5 a 18,5 (4)
- 16,4 a 17,5 (3)
- 15,1 a 16,4 (5)

males

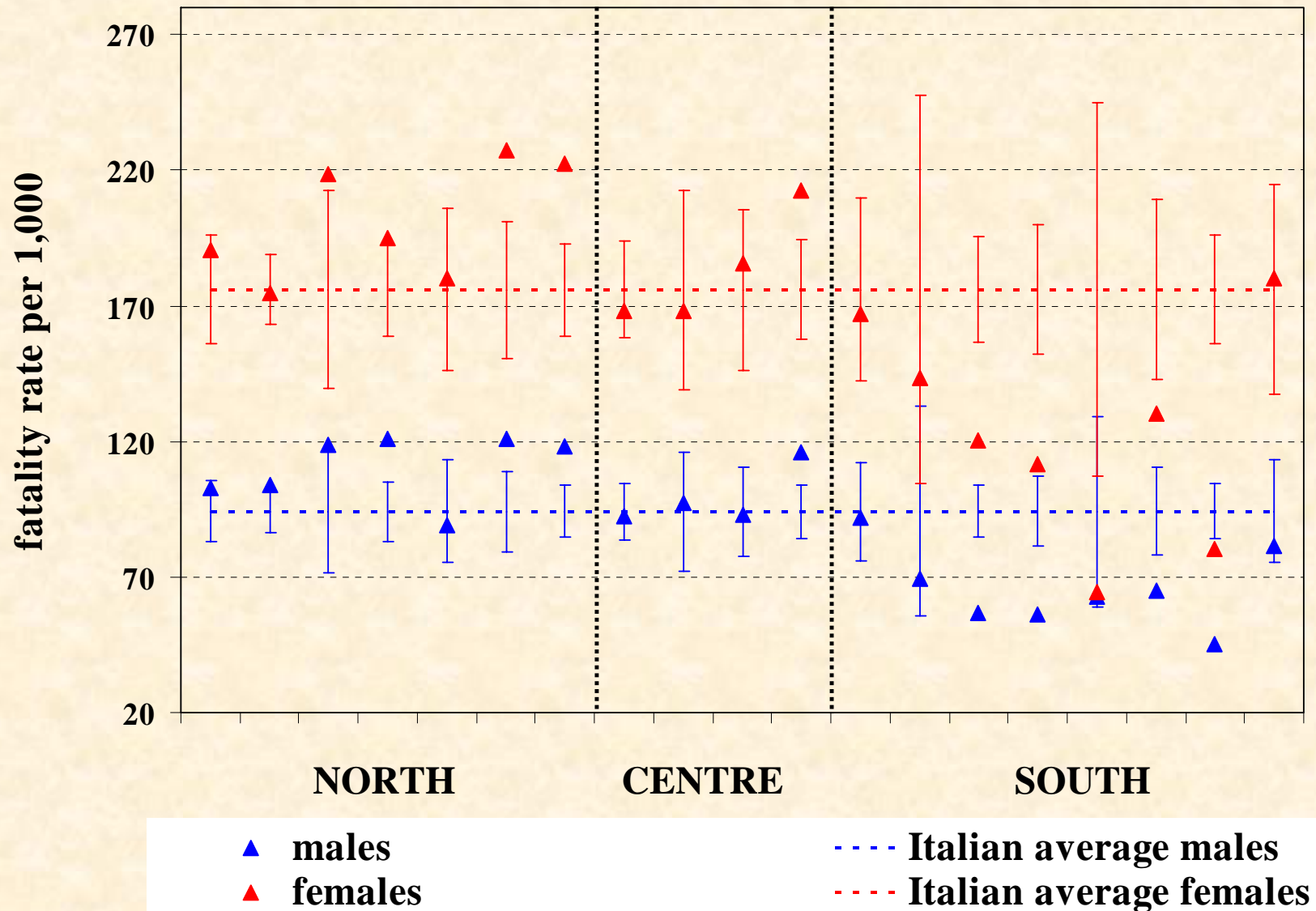


Age-adjusted rates X 10,000
45+

- 12,94 a 14,42 (1)
- 11,46 a 12,94 (4)
- 9,98 a 11,46 (6)
- 8,5 a 9,98 (9)

females

In-hospital fatality in Italy 1999-2000



Is the geographical trend of in-hospital fatality due to differences in:

- **Frequency of the disease?**
- **Hospital admission?**
- **Efficiency and/or quality of primary health care in hospitals?**

Data and methods

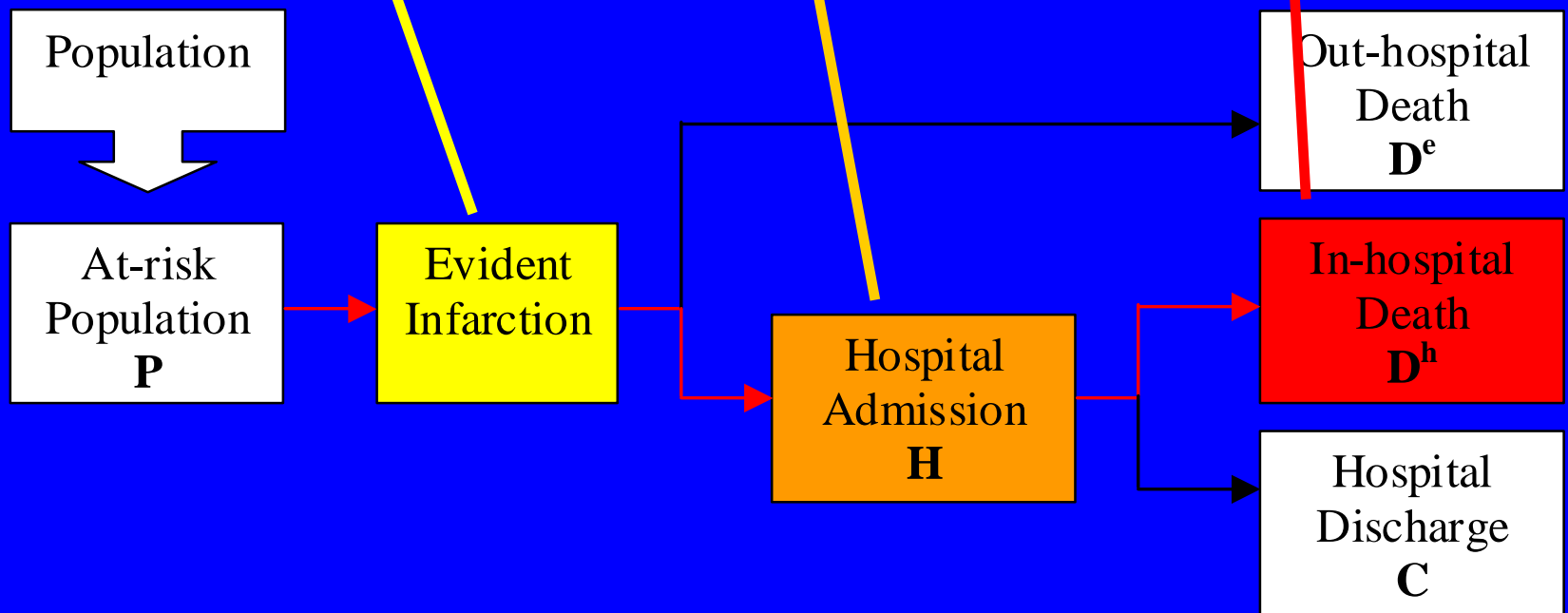
- Data are from two different sources:
 - **Health Ministry** provides # of hospital discharges for AMI by region (1999-2000)
 - **ISTAT** provides cause-specific mortality and population by region (1999-2000)
- Difference between observed and expected in-hospital deaths is **decomposed** into three different contributions:
 - **Incidence**
 - **Hospitalization**
 - **Fatality**

$$i = (C + D^h + D^e) / P$$

$$h = H / (C + D^h + D^e)$$

$$f = D^h / H$$

Event process leading to in-hospital fatality



In-hospital Deaths = Population x Prob (Infarction | Population) x Prob (Admission | Infarction) x Prob (In-hospital Death | Admission)

Underlying hypotheses

- No recoveries outside hospital → silent events are ignored
- No interregional migration of AMI patients
- Intra-regional homogeneity of risk factors

Decomposition

$$D_r^h = P_r \times (i_r \times h_r \times f_r) \quad \overline{D_r^h} = P_r \times (\bar{i} \times \bar{h} \times \bar{f})$$

$$\frac{D_r^h - \overline{D_r^h}}{\overline{D_r^h}} = \frac{\{(\bar{i} + \Delta i_r) \times (\bar{h} + \Delta h_r) \times (\bar{f} + \Delta f_r) - (\bar{i} \times \bar{h} \times \bar{f})\}}{(\bar{i} \times \bar{h} \times \bar{f})}$$

Where

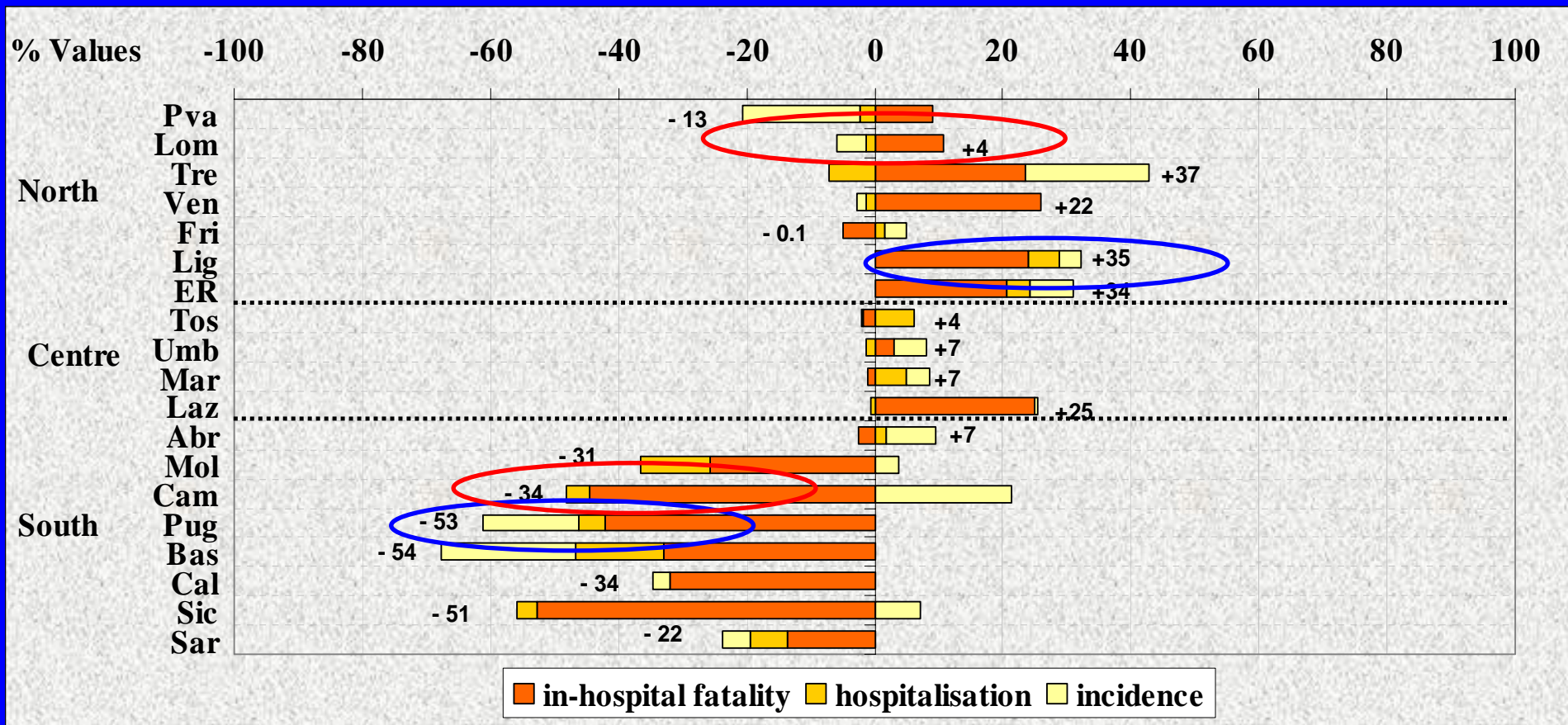
$$\Delta i_r = i_r - \bar{i}$$

$$\Delta h_r = h_r - \bar{h}$$

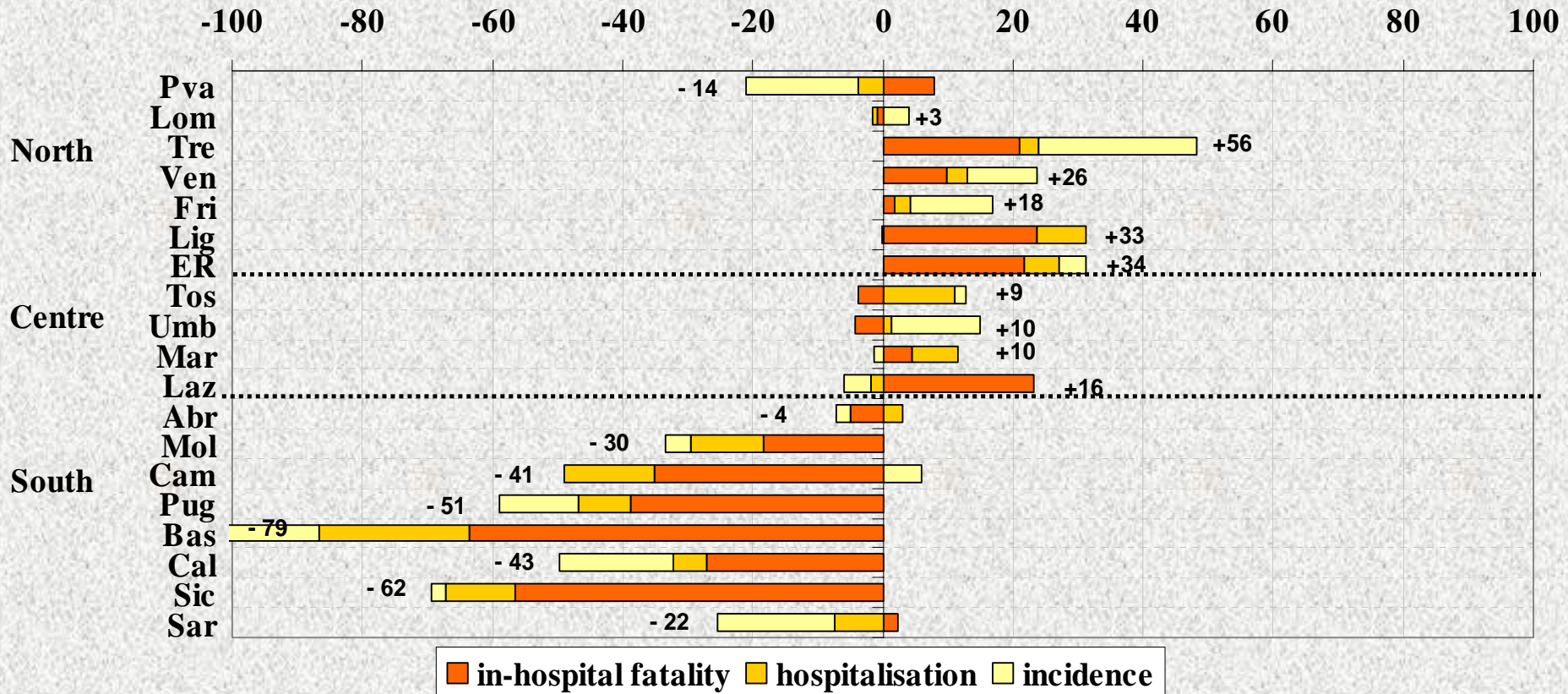
$$\Delta f_r = f_r - \bar{f}$$

$$\frac{D_r^h - \overline{D_r^h}}{\overline{D_r^h}} = \frac{\Delta i_r}{\bar{i}} + \frac{\Delta h_r}{\bar{h}} + \frac{\Delta f_r}{\bar{f}} + \dots$$

Results from the decomposition method: Males 1999-2000



Results from the decomposition method: Females 1999-2000



Features

- Use of **administrative data**: easily available, national coverage, no additional cost
- Investigation on health care system **efficiency**
- Suitable for **acute diseases**

Drawbacks

- **illness severity** is a confounder in evaluating efficiency
- **no follow-up information** → deaths after discharge and repeated events are counted as new cases
- **multiple discharges**: 5% in region Lazio in 2001
→ eliminated 1-day admissions

Conclusions

In Northern and Central regions

- observed in-hospital deaths $>$ than expected

→ more frequent and severe illness ?

In Southern regions

- observed in-hospital deaths \ll than expected
- in some regions although more people become ill and die, less people are hospitalised and die in hospitals

→ case selection before admission?

Some references

- Ferrario M et al. (2001) IJE, Surveillance of ischemic heart disease: results from the Italian MONICA populations
- Mahonen M et al. (2000) EJE, The feasibility of routine mortality and morbidity register data linkage to study the occurrence of acute coronary heart disease events in Finland
- Toffler GH et al (1987) JAm Coll Cardiol, Effects of gender and race on prognosis after myocardial infarction: adverse prognosis for women, particularly black women
- Iezzoni LI (1997) Annals of Int Med, Assessing Quality using administrative data

Index number of in-hospital death proportions

$$\frac{D_r^h / D_r^{tot}}{D_{ita}^h / D_{ita}^{tot}}$$

$$\frac{D_{ita}^h}{D_{ita}^{tot}} = \begin{cases} 0.20 \text{ (males)} \\ 0.27 \text{ (females)} \end{cases}$$

	MALES	FEMALES
Piemonte & V.Aosta	1.0	1.0
Lombardia	0.9	0.9
Trentino-A.A.	1.6	1.4
Veneto	1.1	1.1
Friuli-V.G.	1.5	1.6
Liguria	1.7	1.7
Emilia-Romagna	1.4	1.4
Toscana	1.5	1.6
Umbria	0.9	0.9
Marche	1.2	1.3
Lazio	0.9	1.0
Abruzzo	1.1	1.1
Molise	0.6	0.9
Campania	0.6	0.6
Puglia	0.6	0.6
Basilicata	0.5	0.2
Calabria	0.9	0.9
Sicilia	0.5	0.4
Sardegna	0.8	0.7
ITALIA	1.0	1.0